Report on Trip to Kenya and Zambia Under the Project "Improved Modeling of Household Food Security Decision Making and Investments Given Climate Change Uncertainty" [1]
July 7-21, 2013

By Eric Crawford and Jennifer Olson[2]

Overview

The third major field trip under this project was made to Kenya and Zambia by Eric Crawford and Jennifer Olson. We visited Kenya from July 7 to 13 and Zambia from July 13 to 20.

In Kenya, we worked closely with Dr. Joseph Maitima, Director of Ecodym Africa International, a local NGO with which we are subcontracting to implement field activities. We also met with representatives of USAID/East Africa, USAID/Kenya, the Kenya Agricultural Research Institute (KARI), the Rockefeller Foundation, the Tegemeo Institute of Egerton University, and the University of Nairobi, Department of Agricultural Economics. In Zambia, we met USAID/Zambia, with researchers from the Indaba Agricultural Policy Research Institute (IAPRI), with researchers from the University of Zambia (UNZA) who are implementing a climate change competitive grant from IAPRI, which we are helping to mentor and coordinate with our study, and with crop breeders from ZAMSEED and GART/ZARI.

These meetings are described in more detail below. A detailed calendar of activities and list of persons met, with their contact information, is attached as an annex.

In general, our visit to both countries was very productive. It allowed us to make excellent progress in moving forward with the Year 2 work plan in both countries, and to present our preliminary research results to in-country researchers and development practitioners. An updated copy of the Year 2 work plan will be circulated separately to Clara Cohen, project activity manager in the USAID/BFS/ARP.

USAID/East Africa and USAID/Kenya

We met with Peter Ewell (Regional Agricultural Advisor), Julie Fischer (Regional Climate Change and Natural Resources Advisor), Kaarli Sundsmo (Regional Food Security Coordinator), Stephen Gudz (Agriculture Team Leader, Regional Economic Growth and Integration Office), other members of the East Africa climate change and FTF teams, and Julius Kilungo (Program Specialist/Economist, Agriculture, Business and Environment Office (ABEO) and Mary

[1] Cooperative Agreement Associate Award No. AID-OAA-LA-11-00010 under Food Security III Leader Award GDG-A-00-02-00021-00, funded by the Bureau for Food Security.
[2] Respectively, Professor, Department of Agricultural, Food, and Resource Economics, and Associate Professor, Department of Telecommunications, Information Studies and Media, Michigan State University.

Kwamboka Onsongo (Program Management Specialist, Ag. Markets and Value Chains) from USAID/Kenya.

The objectives of the meeting were to prove a brief overall update of the project, present preliminary research results, review the Year 2 work plan for Kenya, obtain information from the USAID team on related on-going activities, and have a general discussion. We presented slides summarizing the Year 2 work plan for Kenya and providing an update on activities and results since our progress report in Washington in September 2012.

Major suggestions and points of discussion during the meeting included:

1. There was much interest in the policy implications of the effect of various levels of fertilizer applications on maize yield under climate change and variability. This included the limited effect of fertilizer on yield in areas of high temperature and limited precipitation, but the major yield advantages to applying top dressing in areas where precipitation is sufficient but variable. Jenny noted that these types of analyses require daily precipitation data and Julius offered to help obtain data for the stations in Kenya where our project is conducting the household modeling and focus group interviews (probably Embu, Katumani and Rift Valley).
2. Julie Fischer encouraged us to give attention to the regional implications of the project's findings, such as implications of climate change for national maize production and trade, and also to look not just at maize but also at other crops such as sorghum that may perform better under future climate conditions.
3. In this connection, Chihenyo Kangara noted that Kenyans still have a strong dietary preference for maize, the so-called maize syndrome, but said that "you don't have to grow maize to eat ugali."
4. Mary Kwamboka Onsongo (Ag Markets, East Africa) and Stephen Gudz suggested that a good opportunity for outreach on project results would be participation in the ASARECA meetings to be held in Bujumbura in December. The Greater Horn of Africa meetings, held every six months, would provide another opportunity for outreach. Mary said she would send us an e-mail with information on the meeting.
5. Regarding sources of crop budgets, contact information was obtained for Dr. Festus Murithi, Deputy Director of the Socio-Economics unit at KARI, and for his colleague Wellington Mulingi.

Dr. Joseph Maitima, Ecodym Africa International

Dr. Maitima assisted in preparing the schedule for our trip and participated in most of our meetings. During our visit, we finalized the personal services contract for Dr. Maitima's support to the project. The scope of work for Dr. Maitima is contained in Annex C.

Tegemeo Institute

Mary Mathenge and Lilian Kirimi briefed us on the status of their Rockefeller-funded project to conduct research on climate change impacts on households in Kenya using their household survey datasets. The project ends in December 2013 and a final policy workshop needs to be held, tentatively scheduled for November. They have finished their focus group activity and prepared a report. However, work on their household model has been stalled. (Their household model appears to be an econometric model of crop yield similar to the crop yield models

estimated for Zambia.) They have signed an MOU with the Kenya Meteorology Department to have the KMD conduct analyses to produce meteorological results for the household model. Lilian will be working with John Gitau, who is responsible for the modeling, on analysis of this data and estimation of the household model, whose objective is to show the effect of historical climate on output and income.

We discussed possible collaboration on this exercise. For example, this might involve joint work on the design of a common econometric model. We could share the design of the models that we have estimated. Tegemeo could then estimate the model using Kenya meteorological station data and we could estimate it using University of California Santa Barbara Climate Hazard Group's CHIRPS precipitation data, or Tegemeo could do the estimation using both data sets. As follow-up, it was agreed that (a) we would send Lilian the recent report prepared by Ayala Wineman on her work with the econometric crop yield models in Zambia (already sent), (b) Mary would send us a table of the Tegemeo survey areas and their geo-coordinates, so that Jenny could provide the corresponding CHIRPS rainfall data (once its usefulness/accuracy has been evaluated by Jeff Andresen), and (c) Lilian would look for reports on a recent Tea Research Foundation workshop at which work on climate change impacts on tea was discussed, and would send us a copy of their report on focus groups.

It was tentatively agreed that Tegemeo's planned November Rockefeller Foundation project workshop could also present research results done under Jenny Olson's East Africa Rockefeller-funded project. Tegemeo could do the local organization and Olson could contribute funding.

Regarding crop budgets, which our project needs to conduct the modeling, Mary noted that as part of Tegemeo's participation in the new regional network of agricultural policy research institutes (RENAPRI), they are involved in carrying out data collection of costs of production of maize. This will include assistance in mobilizing information for Agri-Benchmark on two representative maize farms, and hosting of Lulama Traub from BIFAP at University of Stellenbosch who will come to Kenya in August to carry out a maize cost of production study. Mary also noted that Tegemeo had done a special survey last year on maize costs of production in the "maize basket" of Kenya (Nakuru, Kitale, and Uasin Gishu areas). She suggested that Eric contact Mercy Kamau in Tegemeo about the results of that survey, as well as about previous work by Tegemeo on crop budgets, which Mary said had never been compiled in a systematic way.

On Friday at noon, Crawford met with Mary Mathenge and Stella Kabuga (Financial Manager) at Tegemeo to discuss administrative issues related to our Tegemeo Agricultural Policy Research and Analysis (TAPRA II) project with Tegemeo, funded by USAID/Kenya through Egerton University.

Rockefeller Foundation

Olson and Maitima met with John Gathenya, who is employed by a University of Reading project funded by the Rockefeller Foundation. Gathenya coordinates East Africa climate change projects for the Foundation. We discussed data analysis and data sharing, including (from MSU) sharing of climate modeling data, and (from Gathenya) parameters of different varieties of maize and other crops to calibrate the crop model for Kenya. It is possible that he will join in the same

November 2013 workshop discussed above to present results of his project (farmer decision making using crop models). Gathenya also mentioned hydrological modeling being conducted by Michael Thomas, civil engineer, to identify surface runoff and water availability for Kenya.

University of Nairobi, Department of Agricultural Economics

We met first with Prof. Willis Oluoch-Kosura, Senior Lecturer and previous director of the Collaborative Masters in Agricultural and Applied Economics, an MS degree program offered by a number of universities within East and Southern Africa. Aside from briefing Prof. Kosura on our project, our main objectives were (a) to gather information on existing sources of crop budgets or household models, and (b) to identify someone who might be able to assist us as a local consultant, both for information-gathering and for collaboration on the household modeling part of the project. Prof. Kosura was not able to provide such information at that time, but he recommended that we speak with Dr. David Otieno, a relatively new lecturer in the department. We (Crawford) were able to talk with Prof. Otieno on Friday morning at the hotel. He was interested in this assignment and sent a CV for our review.

Other Information-Gathering

We went to the National Agricultural Library (NAL) in Kabete to search for Volume III of the Farm Management Handbook for Kenya, a series published in the 1980's by the Farm Management Division of the Ministry of Agriculture, based on long-term support from GTZ. The NAL had copies of Vol. II, but not III. Subsequent e-mail correspondence with Ralph Jätzold at GIZ headquarters revealed that: "The idea to have a volume III with actual farm management information changed to annual Farm Management Guidelines for each district (now county) because the differences from year to year and the local conditions are so changing, that a big book for many years is not the best thing. These guidelines are available as copies of ca. 30 pages in the Min. of Agriculture or in the Counties Agricultural Offices."

Efforts made on Friday, July 12, to contact individuals at the Ministry in order to obtain copies of some of these guidelines were not successful, though additional contact names were obtained (Dr. Irungu or Humphrey Mwangi, Director of Agribusiness).

USAID/Zambia

We met with Dr. Anna Toness (Economic Growth Team Leader) at IAPRI, joined by Nick Sitko and Brian Mulenga. Agenda items were to provide an overview of our planned activities for this year and next, discuss plans for our presentation on Wednesday, and learn about related USAID/Zambia programs and priorities that are relevant to our Year 2 work plan for Zambia.

Topics discussed included:

1. Anna asked about possible links between our work and an assessment of conservation agriculture (CA) as an adaptation to climate change. She asked whether the long-term benefits of CA could be evaluated using our models. Jenny explained that the DSSAT crop model we use includes the agronomic practices of mulching and some other factors, but that the simulated effect on soil carbon and yield does not show up for many, many years. IAPRI, however, has been doing research on CA. Nick and Brian summarized recent and current IAPRI work on CA and the variability of returns to CA. Nick noted

that labor costs are important, and wage rates vary substantially by area. An MSU student, Phil Grabowski, is currently in the field in eastern Zambia conducting research on CA adoption.

2. Regarding sources of information on crop budgets, Anna noted that several USAID FTF contractors are collecting this information in Eastern Province, including PROFIT+ and COMACO. Both are collecting input costs and calculating gross margins. Labor data is being collected for horticulture crops, and CRS is working with farmers who are keeping farm record books, with data on labor and other inputs. Nick noted that a team of IAPRI researchers is currently in the field collecting labor data.
3. Anna asked whether our overall modeling approach could be used after our project as a general decision tool. Can IAPRI be involved, or the M&E unit that USAID is trying to build?
4. Key government units to link with include the Policy and Planning Unit in Ministry of Agriculture, the Seed Certification and Control Institute (SCCI), the GIS department in the Zambia Environmental Management Agency (ZEMA), the Disaster Management and Mitigation Unit, and the Interministerial Global Climate Change Secretariat, where IAPRI is slated to fund a new position.
5. Re: USAID/Zambia funding:
    a. FTF. Anna noted that USAID/Zambia's FTF funding has been cut from $25m/year to $15m/year and now $8m/year, expected to go to $2m/yr. Yet they have very significant FTF programs in place being implemented successfully, and with very thorough M&E and impact assessment activities being carried out. Zambia has the best data available of any FTF country, and should be able to show impacts on a range of important FTF objectives related to nutrition, gender, and poverty. Hence she sees great opportunities for making use of supplementary funding from USAID or other donors.
    b. Global Climate Change Initiative. This funding seems more stable, although it is small. Under GCI there are three funding streams: (i) Clean Energy; (ii) Sustainable Landscapes; and (iii) Adaptation. They have funding mostly for (ii), which includes funding for REDD+ (reducing nonsustainable forest uses in Eastern Province) and government capacity to implement REDD+ and carbon credits. The regional office in Pretoria gets Clean Energy funds, some of which come to Zambia through the Southern Africa Trade Hub. Though they do not get funds for Adaptation, they are working with the National Adaptation Plan for Agriculture.

Key suggestions and action items emerging from this meeting included:

1. Nick noted that data from soil samples collected during RALS12 will be available soon. These may be of use to improve the Zambia soils map, and may be useful in the household model.
2. Nick also noted that shape files for RALS12 and recent CFS survey sample areas are still needed. He has requested these from his contact at CSO (Mr. Masanje). Anna volunteered to write a letter to the CSO Director to request this information.
3. Regarding our desire to calibrate the DSSAT model for additional crops, Anna asked us to send her the type of data we need and she would see whether it may be available by those working on USAID's maize-legume research project (e.g., groundnuts, dry beans).

She is also interested in orange maize, and how it would be affected by climate change. We would need the parameters for orange maize, then, as well.

4. Related to this, Anna volunteered to assist us in obtaining daily rainfall data for our three study zones. She asked us to send her a list of met stations for those zones.
5. Regarding our Wednesday presentation, Anna suggested that we add slides at the beginning to explain what kinds of questions could be addressed by our research. Could impacts of climate change on poverty, and thus on use of non-timber forest products and on forest cover change, be modeled? Could it show who/where the vulnerable households will be in the future? More generally, why is information from this research strategically important and how can it justify investment by USAID partners?
6. What additional capacity, such as in crop modeling, would be needed to conduct this type of work in Zambia? Anna indicated that she might have funding or be able to assist in finding funding for crop modeling capacity building.
7. Regarding future outreach, it was decided that we should make another trip in spring of 2014 and hold two outreach workshops, one with researchers for a full day and one with policy-makers, private sector, and farmers for a half-day.

We presented our project's preliminary research results at a seminar in the U.S. Embassy conference room on Wednesday, July 17. USAID had organized the seminar including issuing invitations, arranging the venue and printing handouts. Approximately 45 people attended from various institutions including the World Bank, UNZA, JICA, GTZ, FEWSNET, USAID, and international NGOs.

Several interesting questions arose during the seminar:

1. What is likely to be the response of groundnuts and recently introduced varieties of orange maize to future trends in rainfall and temperature?
2. How robust are the climate models for Zambia?
3. Policy implications of the modeling results regarding the effect of various N fertilizer levels on maize yield under historical (real) climate variability. Of particular interest was the sensitivity of yield to top dressing compared to basal application only. This has implications for the government's fertilizer subsidy and extension programs.
4. Interest in comparing the effects of various types of fertilizer (P and K, and various levels of N) for basal and top dressing on yields in different zones of Zambia including the highly acid soils of Northern Zambia. This would have implications for adjusting the government's fertilizer packages to focus on high-impact combinations that could provide very large economic savings.
5. Interest in the impact of increasing climate variability on future maize production in Zambia.
6. What are, or could be, the regional dimensions and implications of our project? It appears from the maps that neighboring countries will experience worsening maize production conditions (DRC and Tanzania) or improving conditions (northern Zimbabwe). How is this likely to affect trade among countries in the region?

ZAMSEED

Crawford, Olson and Mulenga met with Dr. Verma on Tuesday at the ZAMSEED farm north of Lusaka. He gave us a very useful history of ZAMSEED and a tour of their farm. Points discussed included the following:

1. Regarding our plan to calibrate the crop model for groundnuts and dry beans, Verma said they produce a small amount of groundnut and bean seed so could provide the type of information needed. He suggested that Alagarswamy (MSU crop modeler) contact him directly. Neither groundnuts nor beans is an attractive product for ZAMSEED because of the low bulking rate. The seed rate is 80 kg/ha, but seed production gives only 800 kg/ha, i.e., 1 ha of seed production is sufficient for only 10 ha of grain production. This compares to maize, where 1 ha of seed production (giving 6-8 tons/ha) is sufficient for 250 ha of grain production.
2. ZAMSEED produces an even smaller quantity (1-2 tons) of millet seed, including pearl or bulrush millet (drought-resistant, grown on border with Namibia and Botswana), and finger millet (grown around Lake Tanganyika).
3. Verma considers Zambia to be the most safe/secure crop production zone within the region, and a "heaven" for maize seed production because of its climate and experienced seed-producing farmers. Zambia can produce seed for a very wide range of areas in tropical Africa. Zambia is already exporting seed to Uganda, Kenya, Tanzania, DRC, Zimbabwe and Mozambique and could produce additional seed for export.
4. The effects of climate change in Zambia are already visible—since independence growing conditions have shifted 400-500 km to the north. The Mt. Makulu station did not see drought 30 years ago but does now, and rainfall is more poorly distributed, especially during January/February. Temperatures have risen as well. People have moved from southern Zambia, and irrigated crops (sugar cane) have come in. Nonetheless Zambia has abundant "safe" growing conditions relative to its neighbors.
5. Verma prefers to let more drought-affected countries do the breeding for drought- and heat-tolerant varieties. He can do the adaptive research testing in Zambia.
6. We discussed the possibility of a project to collect more detailed crop growing data that could be used to calibrate the crop models for more maize varieties and other crops. Dr. Verma suggested that this could be done over a 5-year period at 3-5 ZAMSEED farm sites representing a range of temperature, altitude, soils, etc.
7. We discussed the type of training he needs for his research staff. He said he had recently hired an MS graduate with training in molecular breeding techniques. He expressed enthusiasm for training of one or two of his staff on use of crop models.
8. Regarding our project's results showing the effects of leaching in reducing yield, Verma said when rainfall was high it was important to add N during the growing season. He noted that because of this phenomenon, fertilizer companies have introduced a "coated" form of urea that releases N over time.
9. Regarding our model results on yield performance of the short and long duration (500- and 700-series) maize, Verma thought they looked reasonable, for years with average annual rainfall.

Team from University of Bergen, Norway

We joined Nicky Mason in meeting Birgit Kopainsky (Research Professor in the Systems Dynamics Group, Department of Geography) and her colleagues, Andreas Gerber and Maria del

Pilar Restrepo Saldarriaga. They have launched a five-year research project on the use of systems models and related learning tools to study issues of food security. They are thinking of applying their approach to Zambia, with the specific aim of evaluating different food systems policy strategies for adapting to climate change, using a general systems dynamics model with feedback loops among social, economic, and agricultural systems. They are interested in how people's perceptions interact with scientific knowledge received, and in sources of policy resistance or synergy.

We briefed them on our project and Nicky gave them an overview of major agricultural policy issues in Zambia that might be appropriate to address during their study, including the fertilizer and hybrid seed subsidy and the FRA buying program. Brian gave them an overview of IAPRI work on conservation farming, especially with respect to minimum tillage. Nicky referred them to the "technical compendium" that is on the MSU/Zambia project Web site. We agreed to stay in touch about our respective research activities.

COMACO

To follow up regarding sources of crop budget data, we met with Floyd Mwansa and Moses Tembo from COMACO (Community Markets for Conservation). Moses is the Senior M&E officer, and Floyd manages M&E and farmer cards activities. One of their main programs is promoting conservation farming in Eastern Province (particularly households near the Luangwa National Park), using producer groups of 15-20 farmers, supported by a lead farmer and by extension agents. They have a contract with USAID under which they do pre- and post-harvest surveys and an adoption survey on CA farmers. For USAID's FTF program, they calculate and report gross margins for production activities by CA farmers. Mwansa e-mailed a copy of their data file, and we reviewed their data collection methods and variables—plot size, output, and inputs (mostly seed, including inoculants for soybeans). Information on plot size and inputs used (primarily seed) is estimated by farmers with supervision by the lead farmer. They do not collect labor information.

We also told Mwansa and Tembo about work by IAPRI researchers, and currently by Phil Grabowski, on conservation farming, as well as other work by MSU/IAPRI researchers on the impact of game management areas on household welfare. We will send them copies of these reports, or links where they can be maintained. We have also contacted Phil Grabowski about interacting with COMACO staff based in Chipata.

University of Zambia (UNZA)

We met with Lydia Chabala (Soil Science), Elias Kuntashula (Agricultural Economics), and Peter Kaluba, a colleague of Chabala. They gave us a well-organized presentation that summarized their work to date on climate and land use analysis, and on the survey of farmer attitudes to climate change and modes of adaptation used by farmers. They have added a third research site, in AEZ 1 (covering Nyimba and Sinazongwe), to go along with their sites in AEZ 2 (Choma and Petauke) and AEZ 3 (Mpika and Serenje).

The rainfall analysis looked in part at the frequency of extreme events, defined as days of over 40 mm of rainfall. Olson suggested that a higher threshold should be used, e.g., 60 mm. A next

step is to analyze the effects of rainfall on crop yields, based on yield data from the CSO Post-Harvest Survey.

Work on the household survey is still underway. Major difficulties were experienced in locating the households covered by the RALS12 survey, so extension staff will continue to search for households and administer the survey, through the end of July. Kuntashula expects to have preliminary survey analysis results by October 2013. Part of the analysis focuses on estimating the impact of farmers' adaptation strategies on household welfare. Kuntashula plans to use Stata and an endogenous switching model for the analysis. He asked for help in getting a write-up on the sampling and data collection methods used in RALS12. Brian Mulenga said he would find that and send it to Kuntashula.

We then met with Prof. Suman Jain (Department of Mathematics). Olson gave Prof. Jain a copy of our July 17 presentation, and showed some of the slides. Prof. Jain said she thought that declines of as little as 150 mm/year would be significant in AEZ 1, representing a 20% decline relative to the current average of 600 mm/year. She has been comparing various regional climate models for the South Africa region against CRU[3] precipitation data, and she with others are publishing a paper on the results. She is also still working with the CORDEX (COordinated Regional climate Downscaling Experiment) climate model. Prof. Jain said she was working with an MS student to investigate the intensity of drought. Part of this study would involve calculation of SPIs (Standard Precipitation Index), focusing on the maize growing season, especially the months of January and February. She wanted the student to then examine the effects of drought intensity on crop yield. We briefed her on the work done under our project on estimating crop yield functions, and noted that Brian Mulenga would be carrying out a another round of this estimation using CHIRPS data, for which using SPIs as additional right-hand side variables would be useful. Prof. Jain said she would arrange for the student to meet with Brian.

Catholic Relief Services

On Friday, as part of an effort to identify sources of crop budgets and gross margin analysis, Mulenga and Crawford visited the offices of CRS and met with Ms. Given Musonda Besa. She coordinates the FAME (Farmers' Advanced in Marketing Engagement) project in Western Province. They are currently working with five farmer groups to strengthen their capacity to plan their activities as individuals and as a group. Project activities include education in conservation farming techniques, and visioning exercises to develop longer-term goals and strategies to achieve them. Starting in October 2012, CRS field agents working with the FAME project use laptops and FarmBook software (created by CRS personnel) to collect detailed information about farmers' household characteristics and production activities (plot size, crops planted, inputs used, amounts harvested). Laptops have GPS devices built in. Information is sent automatically to CRS headquarters in Baltimore. Detailed data and a range of reports can be accessed by agents in the field or in the Zambia office. Given the recent start of the FarmBook activity, information on input use and profitability of production activities is not yet available. Ms. Musonda Besa indicated that CRS has recently launched this project in Eastern Province, and has similar projects in neighboring countries, including Zimbabwe, Malawi, and Tanzania.

[3] Climatic Research Unit (CRU), University of East Anglia.

IAPRI Team

During our visit, we briefed the team on our project activities. Mulenga, Sitko, Mason, and Chamberlin were able to attend our Wednesday presentation at USAID. On Friday, we met for lunch to discuss next steps for project activities during the remainder of Year 2 and Year 3, as well as a set of follow-on activities that seem potentially useful based on discussions during our meetings and interests expressed by those attending our proposed February/March 2014 presentation at USAID.

Next Steps

Activities identified for follow-up are listed below.

Exchange of information:

1. We will send:
   - Crop model calibration data needs to Dr. Verma and to Anna Toness.
   - Presentation made to USAID in Nairobi, to Anna Toness.
   - Richardson et al. study of impacts of game management areas on households, and report(s) by Haggblade et al. on assessment of conservation farming, to Floyd Mwansa (COMACO).
   - Recent progress report by Ayala Wineman to all IAPRI research team.
   - USAID presentation to Lydia Chabala, Elias Kuntashula, and Suman Jain at UNZA.
   - List of key ZMD met stations to Anna Toness, Catherine Tembo, and IAPRI team.
   - Current LP models for Northern, Eastern, and Southern to IAPRI team (requested by Chamberlin and Mulenga).
   - Mulenga will send Chabala and Kuntashula the write-up on the sampling and data collection methods used in RALS12 (requested during our meeting).
2. We will request:
   - Materials on crop budgets (KARI, last five years; Tegemeo budgets last year for "maize basket") and focus group report (Tegemeo, under Rockefeller project) from Mercy Kamau at Tegemeo.
   - Chabala/Kuntashula presentation from them, along with latest version of their questionnaire.
   - Information on cost of production data collection being undertaken by RENAPRI as part of the GISAIA project.
   - From Lilian Kirimi (Tegemeo), any report coming out of the Tea Research Foundation workshop.
   - From Mary Mathenge (Tegemeo), table of household survey areas and geo coordinates.
3. Anna Toness will:
   - Send us information of crop budgets and gross margins and a cost-benefit analysis from the PROFIT+ project (already sent).
   - Ask the regional USAID office in South Africa whether they are doing any watershed modeling.
4. When the results of the analysis of RALS12 soil samples are available, IAPRI staff will share them with Lydia Chabala at UNZA so that she can use the information in her efforts to update the soils map for Zambia.

Adjustments in Year 2 and Year 3 Work Plan

For Zambia:

1. If daily rainfall data can be obtained for stations in addition to Lusaka and Chipata, the following analyses not currently incorporated in the work plan could be carried out. Olson's team has identified 10 meteorological stations where they think the data would be adequate for analysis
    a. Analysis of historical rainfall variability and trends.
    b. Modeling the impacts of these climate trends and agronomic practices on crop yield, based on additional crop modeling with DSSAT.
2. Conducting additional crop modeling of maize for Zambia using a lower level of N (5 kg), to better reflect farmer production practices.
3. Conducting additional crop modeling at the point level to examine the effects on yield of various nutrient levels (N, P and K).
4. Initial calibration of the crop model for groundnuts and dry beans, to be completed in Year 3. Information on groundnuts will be sought from Dr. Verma. Information on beans will be sought from Dr. Verma and Dr. Irv Widders, Director of the Legume Innovation Lab at MSU.
5. Collaboration with Prof. Jain's MS student to obtain calculations of SPIs for use in the next round of estimation of the crop yield functions by Brian Mulenga.
6. During Year 3, analysis of the feasibility of examining the effects of future rainfall and temperature trends on the role of conservation farming in Eastern Province, by linking the Haggblade et al. model with maize yield forecasts.

Potential Follow-On Activities or Projects (would require additional resources)

1. Additional sensitivity analysis on fertilizer levels and nutrient combinations for Zambia. While this could be done under the current project for one point (Chipata), it would be useful to do this for all of Zambia. This would require a modest level of resources ($10,000 to $25,000) for additional equipment and researcher time.
2. Examination of the impacts of anticipated climate change on South African regional maize production and trade. This would involve several sub-activities:
    a. Climate analysis of historical rainfall trends and variability during the growing season, using the UCSB/FEWSNET CHIRPS data set.
    b. Downscaling GCMs for southern Africa. Collaboration with the University of Cape Town would be useful, since they have done a lot of work on regional climate models incorporating local land surface parameters, and with BIFAP at the University of Stellenbosch.
    c. Calibrating DSSAT with data on soils and crop characteristics for the region. We have contacts in South Africa that could facilitate this.
    d. We would not propose to do any linking of the climate and crop yield simulations with household models, since it would be time-consuming and expensive to replicate that component of our current model to multiple countries in southern Africa.
3. Crop model calibrated for additional crops in Zambia: Establishment of field plot trials on agricultural experiment stations and/or seed company farms, and related crop model training/capacity building in Zambia. This would enlarge the number of crops and maize

varieties calibrated for Zambia, and improve the robustness of the model for crop breeding and decision making (as discussed above in the ZAMSEED section of the report).

4. Analysis of 1982-2012 satellite imagery data (NASA's MODIS/GIMMS) to:
    a. Identify changes in forest cover and when the changes occurred across all of Zambia (not just for Eastern Province and for two time periods, as under the current Forest Service project).
    b. Examine trends in plant, including crop productivity for all of Zambia from 1982 to present,.

    This could be done at relatively modest cost by a remote sensing specialist at MSU and a statistician at Virginia Tech who collaborates with Olson's team.
5. Extensions of the household modeling to other regions of Zambia, beyond the three sites covered in the current project, using existing household survey data. This could focus on areas where in-migration is anticipated as a result of climate change, or where there is concern about impacts on forests and other natural resources as poor households change livelihood strategies. Included in this could be a more intensive focus on the effects of rainfall variability, using both additional meteorological station data for Zambia as well as the CHIRPS data. This would require a significant input of researcher time for both the climate/crop modeling and the extension of the farm household models.

Annex A

Calendar of Activities and Persons Met

Sunday, July 7, 2013

8:40 p.m.: Arrival, Nairobi

Monday, July 8

9:15 a.m.: Joseph Maitima, Director, Ecodym

10:00 a.m.: USAID/East Africa and USAID/Kenya:
Peter Ewell, Regional Agricultural Advisor
Julie Fischer, Regional Climate Change and Natural Resources Advisor
Kaarli Sundsmo, Regional Feed the Future Coordinator and Grants Manager
Stephen Gudz, Agriculture Team Leader, Regional Economic Growth and Integration Office
Connor Skaggs, intern, FTF team
Chihenyo Kangara, Climate Change team
Sam Weru, Climate Change team
Amber Lilly Kenny
Julius Kilungo, USAID/Kenya, Program Specialist/Economist, Agriculture, Business and Environment Office (ABEO)
Mary Kwamboka Onsongo, Program Management Specialist, Ag. Markets & Value Chains.

Tuesday, July 9

10:00 a.m. to 3:00 p.m. Work at hotel with Joseph Maitima

Wednesday, July 10

10:30 a.m.: Mary Mathenge (Director) and Lilian Kirimi (Research Fellow), Tegemeo Institute of Agricultural Policy and Development

1:30 p.m.: Joseph Maitima

3:00 p.m.: Work at hotel

Thursday, July 11

10:00 a.m.: Joseph Maitima

11:00 a.m.: Prof. Willis Oluoch-Kosura, University of Nairobi, Department of Agricultural Economics, Kabete Campus

3:00 p.m.: At hotel

(continued next page)

Friday, July 12

8:30 a.m.:	Prof. David Otieno, Lecturer, University of Nairobi, Department of Agricultural Economics (met at hotel)
12:00 p.m.:	Mary Mathenge (Director) and Stella Kabuga (Finance Director), Tegemeo Institute
Afternoon:	At hotel. Phone call with Dr. Mussolini Kithome, Agricultural Sector Coordination Unit

Saturday, July 13

7:45 a.m.:	Departure from Nairobi
11:55 a.m.:	Arrival in Lusaka

Sunday, July 14

All day:	Work at hotel

Monday, July 15

10:00 a.m.:	Meeting with Anna Toness, Economic Growth Team leader, USAID/Zambia, at IAPRI
Afternoon:	Work at IAPRI

Tuesday, July 16

11:00 a.m.:	Bhola Verma, Research and Production Director and maize breeder, ZAMSEED (at IAPRI)
2:30 p.m.:	Nicole Mason, MSU Assistant Professor and IAPRI Fellow, Birgit Kopainsky, Professor, Department of Geography, University of Bergen, Norway, and colleagues Andreas Gerber (PhD student) and Maria del Pilar Restrepo Saldarriaga
4:00 p.m.:	At IAPRI

Wednesday, July 17

8:30 a.m.:	At IAPRI
10:30 a.m.:	USAID/Zambia
11:00 a.m.:	Seminar presentation at U.S. Embassy
1:30 p.m.:	At IAPRI
3:00 p.m.:	Floyd Mwansa, COMACO
4:30 p.m.:	At IAPRI

Thursday, July 18

8:30 a.m.:	IAPRI budget meeting
9:30 a.m.:	At IAPRI
1:30 p.m.:	Lydia Chabala (UNZA, Soil Science), Elias Kuntashula (UNZA, Agricultural Economics), Peter Kaluba (UNZA)
3:00 p.m.:	Suman Jain (UNZA, Mathematics/climate change research)

Friday, July 19

8:30 a.m.: At IAPRI
12:30 p.m.: IAPRI lunch meeting: project next steps and possible follow-on
3:00 p.m.: Given Musonda Besa, Catholic Relief Services
4:30 p.m.: At IAPRI

Saturday, July 20

Work at hotel
9:30 a.m. Departure from Lusaka (Olson), travel to Tanzania
11:50 p.m.: Departure from Lusaka (Crawford)

Sunday, July 21

3:10p.m.: Arrival in the U.S.

Annex B

Contact Information

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Annex C

Scope of Work for Dr. Joseph MaitimaUnder the Project
"Improved Modeling of Household Food Security Decision Making
And Investments Given Climate Change Uncertainty in Zambia and Kenya"
USAID Associate Award AIDOAA-LA-11-00010
Under Food Security III, CDG-A-00-02-00021-00

EFFECTIVE PERIOD: July 10, 2013 to September 30, 2014.

OBJECTIVE: Dr. Joseph Maitima, Director of Ecodym Africa International, will support the activities of the project, "Improved Modeling of Household Food Security Decision Making and Investments Given Climate Change Uncertainty" in Kenya by providing scientific advice, conducting fieldwork, and coordinating with other Kenyan institutions on behalf of the project.

TASKS:

1. Organize and participate in meetings with USAID and other organizations in Kenya on behalf of the project. The purpose of the meetings will include gathering and sharing data and information, and coordinating activities. ($1,000)

2. Conduct focus groups and key informant interviews in three Kenyan communities to derive information on the impacts of climate change and variability, current coping or adaptation practices, and other topics. The focus groups will be gender-disaggregated (i.e., men and women will meet separately). The location of the communities and details of information to be collected will be decided with Dr. Jennifer Olson ($5,000)

3. Submit reports on the results of the focus groups and key informant interviews. ($3,500).

4. Conduct feedback workshops in three communities to share project results and to discuss adaptation possibilities. Prepare a policy brief and/or poster, and distribute it to the communities and others ($5,000).

5. Submit a report on the results of the feedback workshops, including community and key informant responses to the project results and their discussion of adaptation practices. ($3,500)

6. Contribute to the writing up of the project results in project reports and scientific articles. ($2,000).

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Dr. Joseph Maitima (Date)
Ecodym Africa International